lutely impregnable—against the intellectual foundations of empirical science. So impregnable, in fact, to the author's mind that he can afford to detail in the preface, with inimitable *naïveté*, his many discouragements in the preparation of the work—the fact, for instance, that of eight Fellows of the Royal Society with whom he has communicated all have declined to read and criticise advance proof-sheets. Sir Oliver Lodge has even gently indicated that Mr. Hiller's previous works have not impressed him; the letter is printed in full as a kind of *imprimatur*.

Briefly stated, Mr. Hiller's main position is that causality resides solely in the human will, and not at all in matter, atoms, ions, ether, electricity, or any of the other entities with which modern science deals. What reality ordinary objects possess is not quite clear, but apparently the action which we ordinarily suppose them to effect really belongs to the human being using them. Thus "a knife is a fetish facilitating cutting," *i.e.* cutting could quite well be done by the unequipped human will, but human nature being weak finds it useful for ordinary purposes to rely on the God-determined illusion of knives and scissors. Food becomes unnecessary, or can readily be replaced by poisons. In fact, there is no poison or disease at all but thinking, or rather willing, makes it so, *i.e.* if the individual will, acting on its own initiative, has not endowed an object with such and such attributes, then the consensus of other human wills, acting through hypnotic suggestion, so endows it. In this way, we presume, Mr. Hiller would account for the occasional death of infants by accidental poisoning. Doctors not only cure diseases, but also create and propagate them.

Considerations of space forbid a statement of Mr. Hiller's doctrine of perception, with its singularly elegant terminology—top storey of mind, mnemonic storey, and the like. But a word of criticism must be added, even if it is foolhardy to rush in where eight Fellows of the Royal Society have declined to tread. So far as we can understand our author, he seems in too great a hurry to explain abnormal experiences. He revels in things that make our flesh creep, people whose staple diet is strychnine, "Katie King" apparitions, ghosts that have pulses and heart-beats. Now of course we should all like to build up absolutely exhaustive systems, but at present well-sifted evidence of the extraordinary is so difficult to procure, and the abnormal is so often exploited by charlatanism for private ends, that science, which is long and patient, will rather wait a little and concentrate itself upon the normal. Again, there is obviously a difference in the glory of fetishes; there is one fetish which facilitates cutting, and another which facilitates Marconigrams. Will Mr. Hiller seriously maintain that a consensus of even all existing human wills could interchange these at its pleasure? Why had we to wait until the twentieth century for radio-activity? Could a sufficiently strong will in the nineteenth have produced the same effects by means of shoe-blacking?

We gather from the preface that this attempt to prove the rest of the world insane is merely a provisional instalment of a greater work, to be entitled "Sic Transit Scientia"! So important an effort to overthrow the walls of the empirical Jericho must be carefully timed; we can only suggest as the most fitting date of publication the eve of the Greek Kalends.

IONS AND ORGANISMS.

Studies in General Physiology. By Jacques Loeb. 2 vols. Pp. xxix+782. (London: T. Fisher Unwin, 1905.) Price 31*s.* 6*d.* net.

THE two volumes of papers collected under this title form one of the most interesting and suggestive works that have been published on the subject. The bold idea, that by means of alterations in the composition of the solutions that bathe the tissues it is possible profoundly to affect not only metabolism and growth, but also such processes as fertilisation, has led to a series of experiments here recorded that are well worthy of careful study.

The material with which Prof. Loeb and his pupils have worked has been in the main organisms of such a size that the whole animal could be acted on by changes in the salts dissolved in the water in which the animal lived. Most of the experiments were made with either the embryos or eggs of marine animals belonging to the groups of Annelidæ, Echinoderms and their allies; some were on fish embryos, some on hydroids, and the earlier experiments, which seem to have furnished the author with the leading idea for these researches, frog's muscle. This idea, shortly summarised, is that the changes in the composition of the solutions are effective on account of the properties of the various ions added or subtracted, and that by varying these one can control the various biological processes. The control is supposed to be direct, and ions are even termed "toxic" or "antitoxic" according to their suggested action on any process—for example, Sodium ions are "toxic," because they prevent the development of fundulus ova, Calcium ions are "antitoxic" because they neutralise this action.

The experiments which have perhaps attracted most attention are those on artificial fertilisation. Addition of HCl to the water in which the eggs of starfish (Asterias) were suspended caused them to develop parthenogenetically; similarly Ca was efficacious for the eggs of Amphitrite, KCl for Chaetopterus, and either KCl, NaCl, or even evaporation of sea water for the eggs of Arbacia, an Echinoderm. As to the accuracy of the observed phenomena, most of Prof. Loeb's readers will accept the evidence here adduced; whether the results bear the importance attached to them is a more open question. The author himself points out that these eggs are naturally on the brink of parthenogenetic development; in fact, if left to themselves they usually begin to segment spontaneously, and the effect of the addition of the various ions is only to hasten a naturally occurring process. It perhaps asks too much, but one regrets that the experimental difficulties so far seem to have prevented any of the parthenogenetic animals from attaining adult life.

For the rest, one notices that Prof. Loeb derives his inspiration from internal sources, and that quotations from other authors and from the *Archiv f. allgemeinen Physiologie* occupy but a small place. What, however, is more natural, if an author has sufficient new and interesting material to draw upon, than to confine himself to his own observations? Enough has been said to convey our impression that the two volumes now under review well repay careful consideration, and that the facts recorded therein mark an important advance in our knowledge of general physiology.

OUR BOOK SHELF.

Civil Engineering: A Text-book for a Short Course. By Lieut.-Col. G. J. Fiebeger, U.S. Army. Pp. xiii+573. (New York: Wiley and Sons; London: Chapman and Hall, Ltd.) Price 21*s.* net.

THIS text-book on civil engineering is especially intended for the use of cadets of the U.S. Military Academy, whose duties later are often those of a civil engineer. A short course on this subject is therefore provided, and this work is evidently based on the author's lectures at West Point. It is natural to expect that in these circumstances the treatment of the theory of structures will be that of the engineer rather than of the pure mathematician, and that it will be of the simplest possible character. It is therefore disappointing to find that this section is treated in an almost purely academic way involving much chasing of x, with little or no appeal to physical ideas. This is well illustrated by chapters iv. and v., mainly on the deflections of beams under various conditions of loading and fixing, a section of forty-nine pages, involving one hundred and ninety-three numbered equations, with little or no indication of their physical meaning. A semi-graphical treatment would have been far preferable for military cadets studying this subject with a view to practical applications, and this remark applies to other parts of the book; thus we should imagine that a student, after reading chapter iii., on the flexure and bending of beams, would have considerable difficulty in calculating the moment of resistance of a section such as a bridge rail, a perfectly easy problem by a semi-graphical method and one likely to require solution by an officer who "in an isolated station finds himself called upon to act as an engineer and constructor of buildings, roads, and bridges," with possibly a miscellaneous collection of materials.

In the purely descriptive part of the book the author is much happier, and a great deal of valuable information is contained in this section. Throughout the book the author is somewhat free with his terms; thus his use of the word molecule leads him to the statement that "the unit shearing stresses on the vertical and horizontal faces of the elementary molecule are equal," while other terms, such as "curve of mean fiber" and "spontaneous axis," might be amended with advantage. E. G. C.

Thunder and Lightning. By Camille Flammarion. Translated by Walter Mostyn. Pp. 281. (London: Chatto and Windus, 1905.) Price 6*s.* net.

THIS book contains no translator's preface, so one is apt to believe that it is a translation of M. Flammarion's "Les Phénomènes de la Foudre." A comparison of the two volumes shows that the titles of the chapters in each are identical, with the exception of two chapters of the French work which are merged into one in the translation. A closer examination leads one to conclude that the English edition is a very abridged form of the French, and the illustrations, which number fifty-four in the latter volume, only total nine in the translation. It is clear, therefore, that the two volumes are very different from each other, although one is supposed to be a "translation" of the other, since nothing is said to the contrary.

Apart from the above mentioned differences the English translation is well done, and will be found very interesting reading. The greater portion of the book is devoted to the effects of lightning flashes, and a large number of examples are described. Thus we have the effects on mankind, animals, trees, plants, metals, objects, and houses. Many instances are narrated of the vagaries of fireballs, and two chapters are devoted to atmospheric electricity and storm-clouds, and the flash and the sound.

Photography for the Press. By the editor of *The Photogram.* Second edition. Revised and very largely rewritten. (London: Dawbarn and Ward, Ltd., 1905.) Price 1*s.* net. Cloth, 2*s.* net.

THIS very complete and practical book contains hints to the photographer who wishes to make use of his pictures for press purposes. The editors acknowledge that this is a new departure in photographic literature, but the fact that the present edition is the second indicates that a want has been supplied. So large is the number of illustrated journals, books, &c., at the present time, and they are still on the increase and likely to become much more numerous, that time and possibly disappointments will be saved to the photographer if he becomes acquainted with many of the hints included in the present issue. In addition to some general remarks about the relation of the editor and publisher to the photographer, practical field and workshop methods are also discussed. Interesting and valuable information on the copyright union, copyright law, permits to photograph, &c., are next taken up, and lastly there are lists of agents for press photograms, publishers of picture post-cards, and the principal illustrated periodicals with all up-to-date information, such as class of print preferred, size of page, date and time to which originals are usually received for current issue, &c.

From the above it will be gathered that the book is intended to serve a very practical purpose, and the editors have produced a book that will be serviceable to many photographers.

How to Know the Starry Heavens. By Edward Irving. Pp. xvi+313. (London: T. Fisher Unwin, 1905.) Price 8*s.* 6*d.* net.

THIS volume is, avowedly, not so much a text-book for astronomical students as "an invitation to read text-books on the subject," but while it contains a large amount of real information, we fear that the matrix is so bulky that the reader to whom the book is intended to appeal will find great difficulty in discovering and assimilating the real facts. After discussing the apparent motions of the heavenly bodies and the rival theories concerning them, the reader is conveyed towards α Centauri in "The Chariot of Imagination" in order to gain some idea of the cosmological insignificance of the earth and to view more closely the sun and his system. Then the author attempts to instil a concrete idea of the dimensions of the visible universe. To this end he gives about twenty different illustrations, each one under a prominent subtitle such as "A Pile of Blood Discs" or "A Spider's Web," the whole occupying about fourteen pages. Succeeding chapters deal with other astronomical subjects in a popular manner and with more or less convincing illustrations.